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## THE PEACH ROSETTE.

PLATES VIII-XIII.

By ERWIN F. SMITH.

In the first bulletin on peach yellows some account was given of a peculiar peach disease prevalent in Georgia and not visibly associated with fungi. This account was based on correspondence and specimens received through the mails. In some particulars the specimens agreed exactly with yellows. In others they differed somewhat, and I was in doubt what it should be called. A full opportunity to examine it in the fields and orchards of middle Georgia in the summer of 1890 still left me with some doubt. It seems best, therefore, to call it "the peach rosette" until it can be determined whether it is identical with yellows, as now seems probable.

This disease agrees with peach yellows, as already defined, in the following important particulars :

I. On some of the trees winter buds and obscure buds push into diseased, branched growths identical with yellows. All of the growths would be identical if the shoot-axes were elongated.

II. Winter buds show the same tendency to unfold in summer and autumn. I saw such immature, feeble growths as late as November 6.

III. Part of a tree may be affected while the rest appears normal.

IV. The disease can be communicated to healthy trees by inserting diseased buds. In my inoculations of June 21, sixty per cent of 125 stocks showed symptoms of the disease in four and one-half months.

The disease differs in the following particulars :

I. The entire tree is more apt to be attacked all at once, and the disease is more quickly fatal. Trees often die the first year, and I have not heard of any cases living beyond the second season. What corresponds to the first stage of yellows *seems* to be wanting.

II. On the parts attacked, many obscure buds and all or most of the winter buds push into diseased growths suddenly *in early spring*. The primary shoot-axes grow only an inch or two, but send out many short branches. This gives to each growth a compact tufted form, and to the affected tree a very peculiar appearance unlike anything heretofore described, and much resembling the work of insects. These stunted, green, or yellowish rosettes often form the only foliage of large trees, projecting from the ends of long, naked twigs like leafy galls, or like house leeks tied to the ends of sticks (see Pl. IX).

III. The lower leaves on these tufts or rosettes roll and curl, turn yellow, dry up at the ends and edges, and fall early. They begin to drop before midsummer, and a slight jar shakes them off by the hundred.

IV. On the trunk and base of the main limbs it is rare to find anything more than rosettes, and often these also are wanting, the diseased growths being confined to the extremities of the branches.

V. Diseased trees seldom bear fruit of any sort. Most growers deny that such trees ever bear premature fruit, but one man who has lost two orchards insists that he has seen it. No fruit could be found in Georgia peach orchards in 1890, and this point was necessarily left unsettled.

VI. The disease occurs in wild and cultivated plums, to which it is quickly fatal. Thousands of the wild Chickasaw plum (*Prunus Chicasa*) have been killed by it during the last few years. I also saw it in two Japanese varieties—Kelsey and Bhotan—and in one or two American varieties probably derived from *P. Chicasa*.

If this malady is yellows, our definition of that disease must be somewhat modified and enlarged to include the plum or at least certain varieties of it. My previous statements relative to the immunity of the plum were based on observations north of Virginia and had special reference to varieties of *Prunus domestica*.

This disease has been in upper middle Georgia for at least 10 years, and during this time has destroyed whole orchards. With some noteworthy exceptions it has not swept away budded orchards as quickly as the yellows of the North, but it takes some trees every year, and is evidently a dangerous enemy. This is true especially, because of its prevalence in the hardy wild plum which grows everywhere. During my visit I saw the disease in twelve counties: Fulton, Clayton, Campbell, Henry, Spalding, Pike, Meriwether, Coweta, Troup, Talbot, Harris, and Muscogee, and heard of it in ten others: Upson, Monroe, Bibbs, Butts, Jasper, Putnam, Greene, Taliaferro, Morgan, and Oglethorpe. It is widespread and well established in that part of Georgia.

The disease attacks cultivated and neglected orchards, young and old trees, seedlings and budded fruit. If anything, it is more prevalent in thickets and waste places, the edge of forests, and on the borders of streams, or by the wayside, than in orchards. It is not restricted to any special kind of soil or prevented by any method of cultivation. It occurs on the common red clays, on the gray and granitic sandy lands, and on a chocolate-colored, deep, fertile loam, commonly called "mulatto land."

A disease which appears to be identical (see Pls. XI–XIII) occurs also in Kansas. So far as known, it is now present only at Manhattan, and has not yet appeared in the important peach districts of southern and southeastern Kansas.

The attention of the writer was first directed to the disease by Mr. T. C. Wells, who sent specimens in 1889. The malady continued in 1890, when Dr. Kellerman also sent specimens and made inquiries. Later in the year I was able to examine it more carefully in the orchards themselves.

The farm of Mr. Wells is in the Kansas River valley, on a fertile, rolling prairie, about midway between the bottom lands and the limestone hills, *i. e.*, on what is called the "second bottom." The soil is a dark and a very deep loam, gradually shading into a reddish brown,

clay subsoil. In moist seasons this soil yields from 40 to 60 bushels of shelled corn. Apples, plums, grapes, elms, negundos, etc., also grow in it vigorously. The soil must contain plenty of lime, since horizontal, eroded ledges of limestone crop out everywhere on both sides of the Kansas valley for miles and miles.

This orchard of choice budded fruit contained only about two hundred trees, but they had always been thrifty and well cared for. The older trees were 8 to 12 years old and had borne several good crops; the younger (about fifty replants) were 4 to 6 years old and had borne only one crop.

Mr. Wells first noticed this disease in 1889. He says there were no cases in his orchard prior to 1889. That year more than 75 per cent of the trees became affected in whole or in part. The disease appeared in the spring and most of the trees were dead or dying when cut down the following autumn. A very pestilence seemed to have stricken the orchard.

In August, at the time of my visit, only about fifty trees remained. These were replants, 4 to 6 years old, and had been thrifty. Dr. Kellerman and Mr. Swingle carefully examined them in July, 1889, at which date about one-half were healthy. Dr. Kellerman accompanied the writer in an examination and we could then find only two healthy trees. The rest were diseased in the same way as the cases of the previous year—some were dead and the others showed symptoms throughout or on a part of the tree only. All trees which were noted as affected in July, 1889, were dead or dying.

Neighboring orchards were almost as badly affected. Most of these were neglected seedling trees in sod ground. About one hundred cases were also observed in a peach thicket where the struggle for existence was severe. In none of these places could I satisfy myself that the disease had been present more than two seasons, and the question of its origin is exceedingly obscure.

As in Georgia the terminal shoot-axes were developed into tufts all over the tree, but usually these were somewhat less compact. None of the peach trees had developed any luxuriant branched growths on the trunk or base of the main limbs as is common in the yellows of Maryland and Delaware, but the winter buds were pushing in the same way. Last year some of these trees bore fruit, but I could not learn that any of it ripened prematurely. Frequently one-third to two-thirds only of the tree was visibly affected. Occasionally trees would be diseased, dwarfed, and yellow throughout, except one or two small terminal shoots in the top of the tree. These, in striking contrast, bore leaves of normal size and color. This also happens in Maryland and Delaware in ordinary yellows.

This disease was also observed in cultivated plums of the Chickasaw type and in the hard shell almond. I have no hesitation in saying that it is identical with the disease which occurs in Georgia.

This rosette disease resembles yellows very closely, to say the least, and there are transition forms in both States. and growths not distinguishable from genuine yellows. The absence of the prematurely ripened fruit may be due to the suddenness and severity of the attack. The long, dry summer or other climatic peculiarities of these two regions may possibly account for this, and also for certain other symptoms at variance with the yellows as heretofore known and described. These are points to be worked out hereafter.

The disease in Georgia has been erroneously attributed to the attacks of Scolytid beetles. \* *Scolytus rugulosus* is common in Georgia, and rather destructive, but in June the mother beetles were only just commencing to burrow into the bark preparatory to depositing their eggs, *while the trees had been affected with this disease for several months*. Moreover, in June there were many diseased trees which had not yet been attacked by a single beetle or had only a few borings. To satisfy myself I examined some of these carefully over every square inch of their surface; cut the bark open in every direction, and examined each one of several thousand rosettes, *e. g.*, the tree figured on Plate IX. In July it was more difficult to find such trees, although not impossible, *e. g.*, on June 30, in company with Mr. Rudolph Cetter, I examined four trees in a middle-aged, seedling orchard near Griffin, Ga., with the following results:

(1) This tree was nearly dead and the rosettes had a droopy look. In a section of one limb, which was not over  $1\frac{1}{2}$  inches in diameter and 2 feet long, we found 83 excavations made by *Scolytus rugulosus*. The beetles were present and burrowing in most of these holes, but not yet buried out of sight. The evidence of recent occupation was strong.

The tree probably contained a thousand beetles, but most of them had been at work only a few days. They had bored into the base of many of the rosettes, and this was what gave to the foliage its wilted, drooping appearance. This tree died in July, 1890. It was probably attacked by the rosette disease in 1889.

(2) This tree was diseased in all parts, and did not bear a single full grown leaf or shoot-axis, but the rosettes were still green and fresh. This tree was even more minutely examined than the preceding. In the trunk and main branches there were no beetles, no holes, and no internal borings or chambers. There were also very few injuries on the smaller twigs, the most careful search bringing to light only half a dozen.

(3) This tree contained many beetles. The foliage was wilted and drying up as in No. 1.

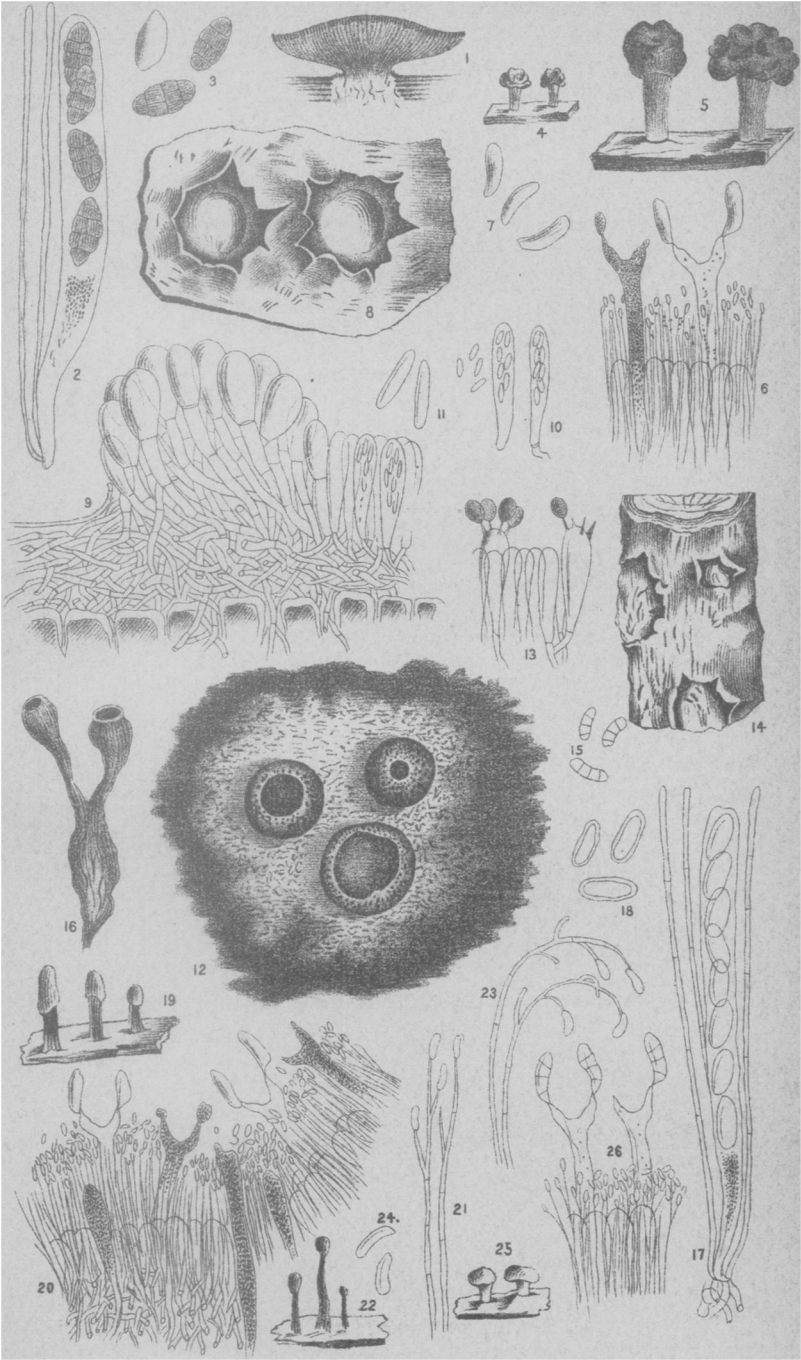
(4) This tree was like No. 2 in appearance. It was also like it in being almost completely free from beetles or borings due to them.

No larvæ or pupæ were found in any of the trees.

It is wholly impossible to account for several thousand diseased growths scattered over the whole top of a tree by the slight borings of a few dozen beetles, even admitting their constant presence in the

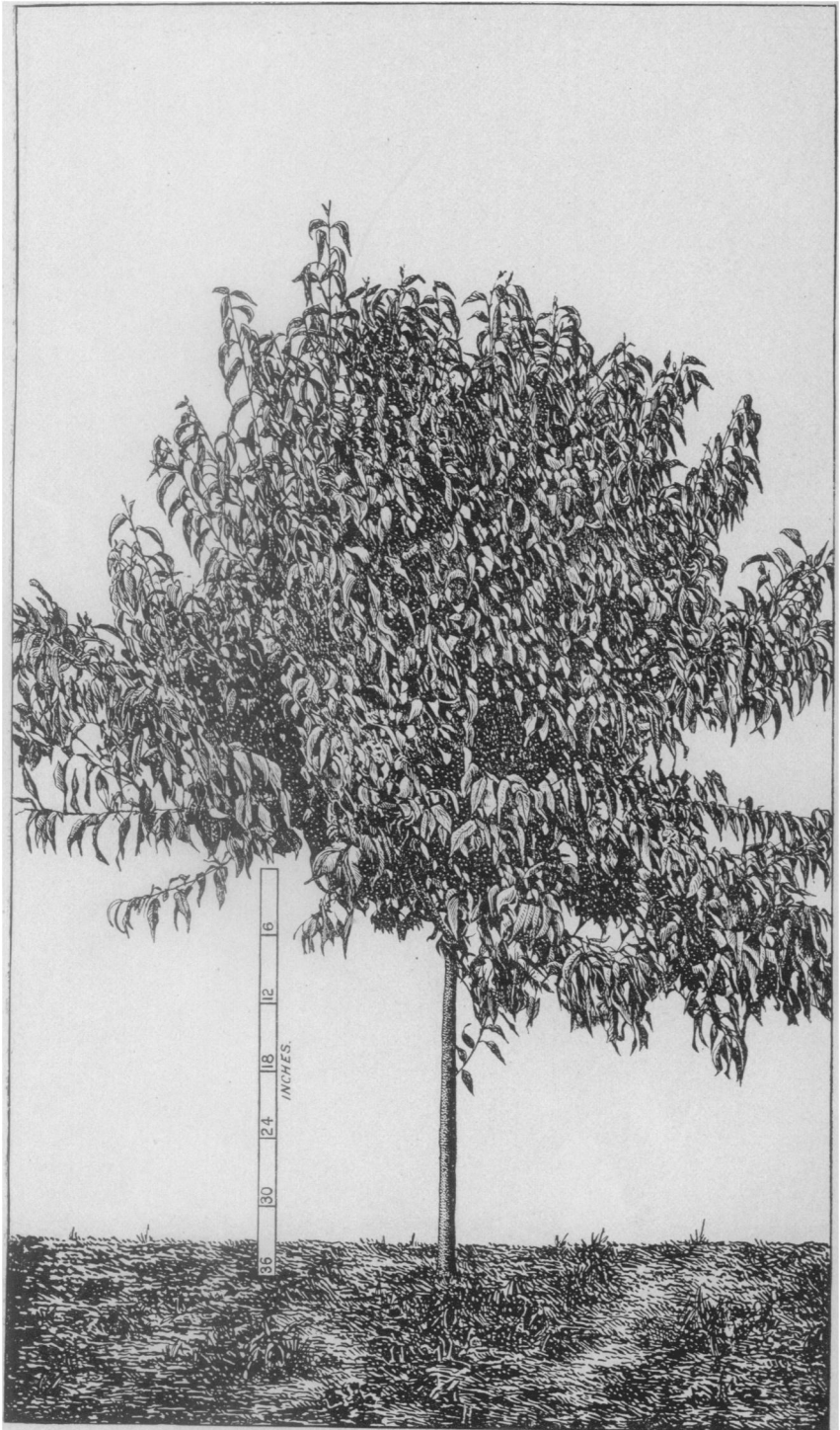
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\* *Proc. Georgia State Hort. Society*, 1889, pp. 16 and 46.

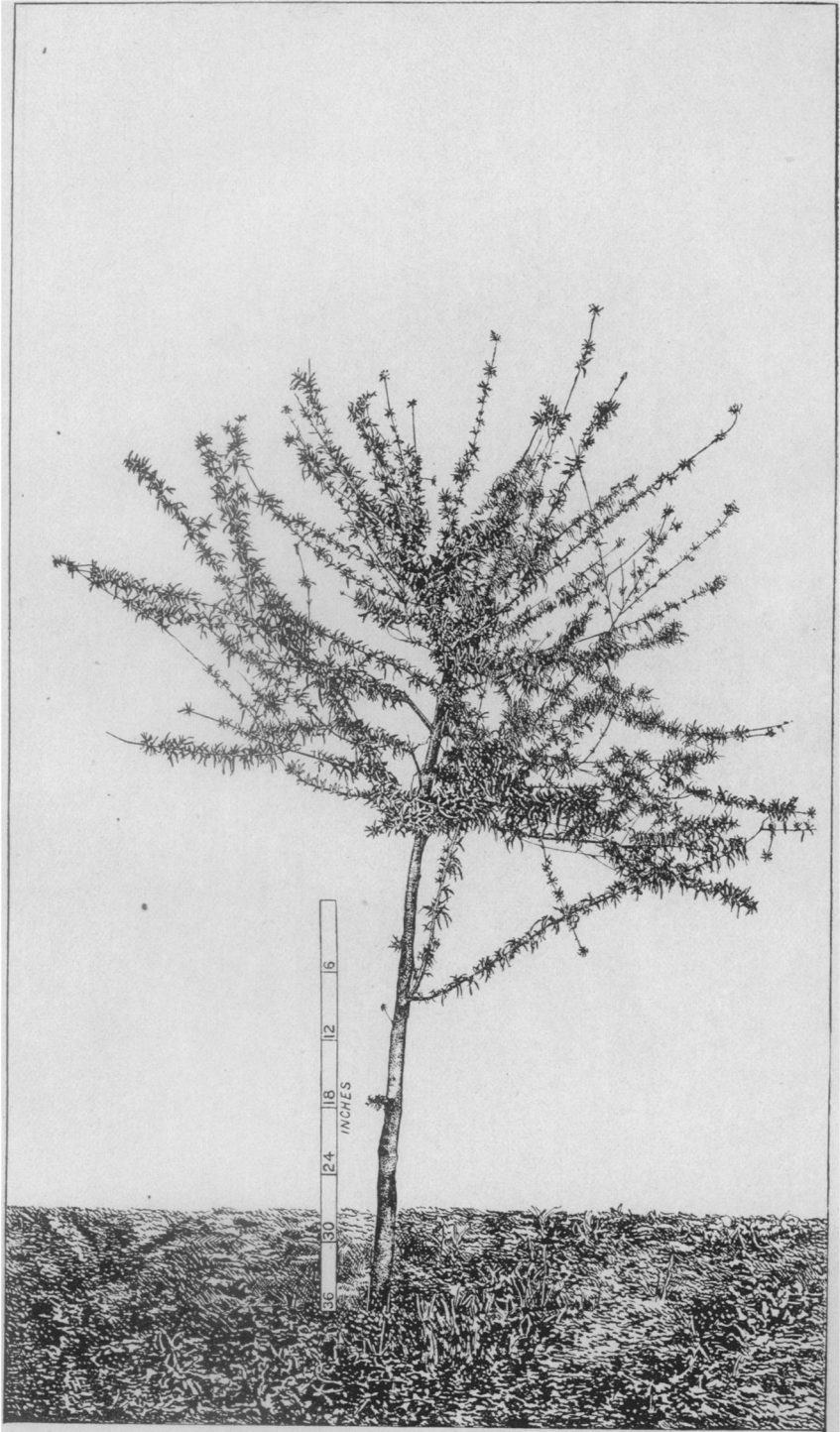


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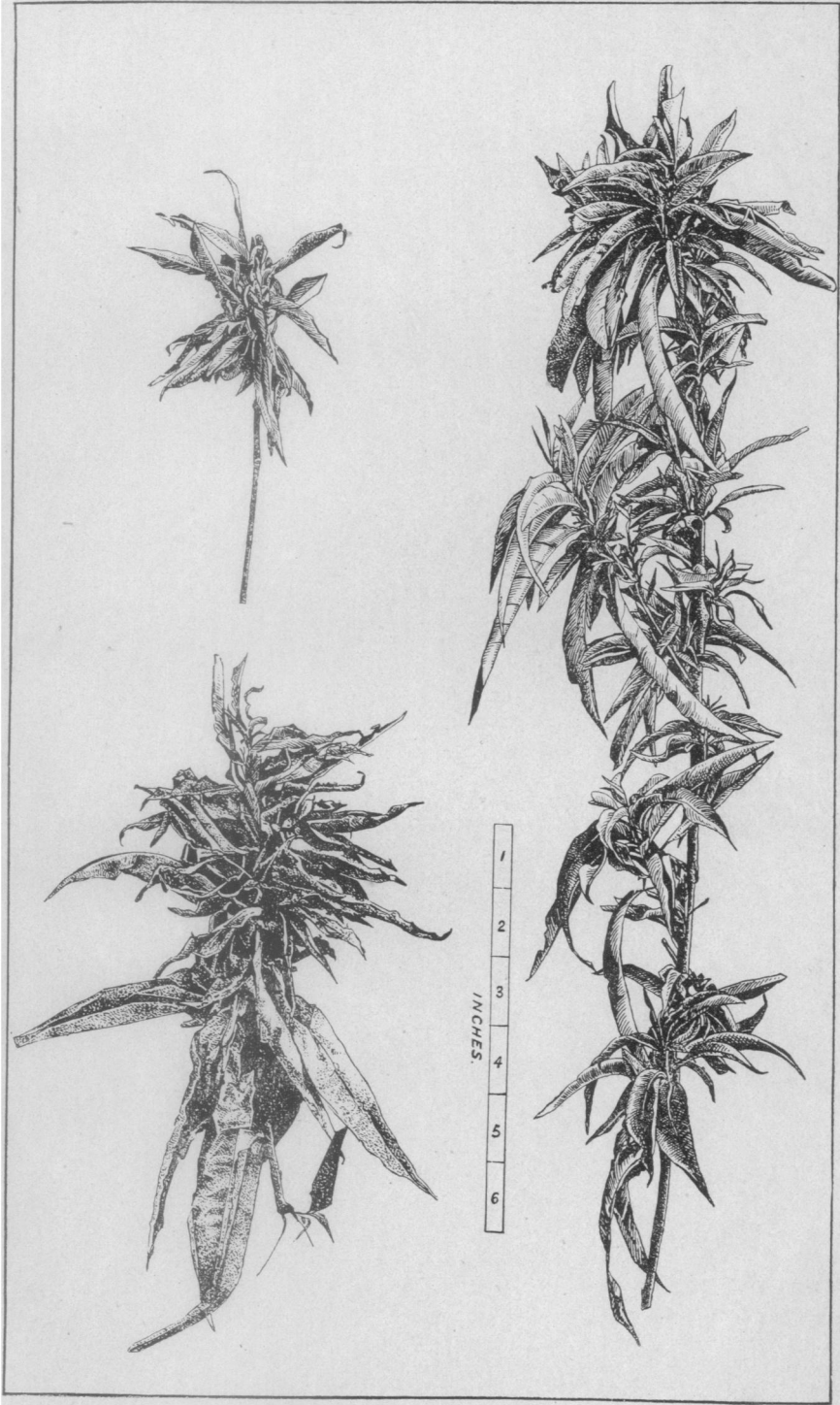
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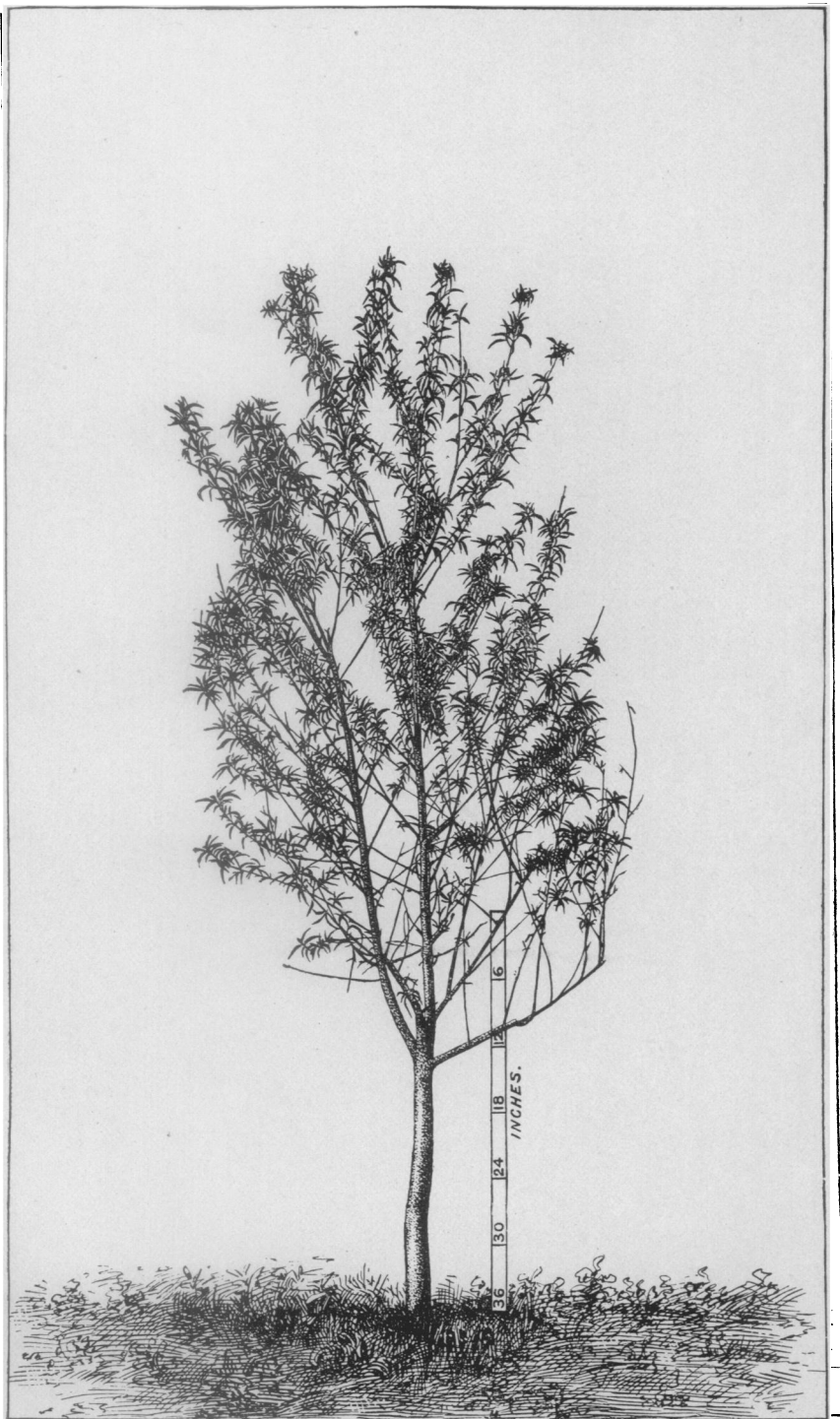
HEALTHY PEACH TREE.—GEORGIA.



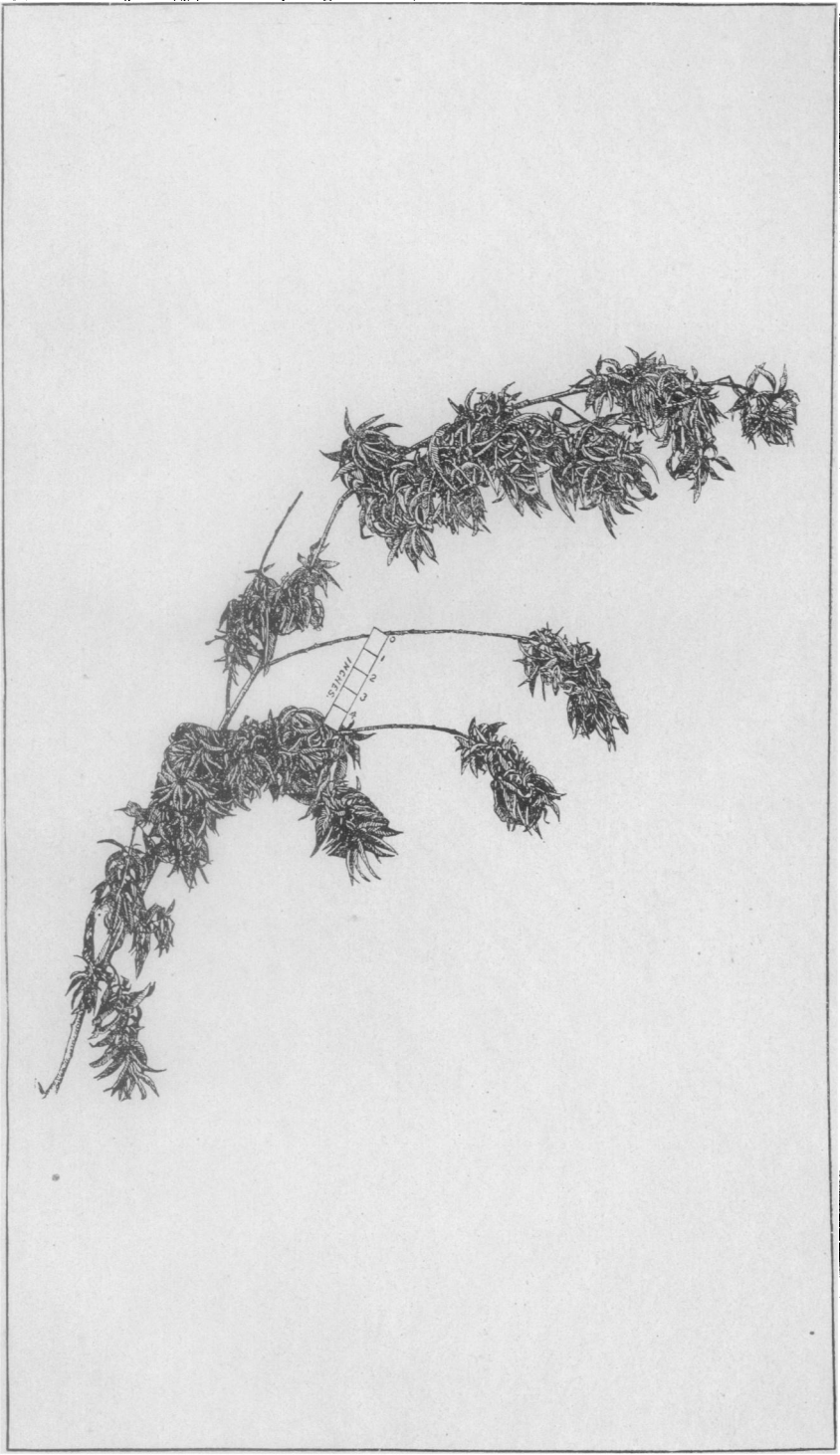
THE ROSETTE.—GEORGIA.



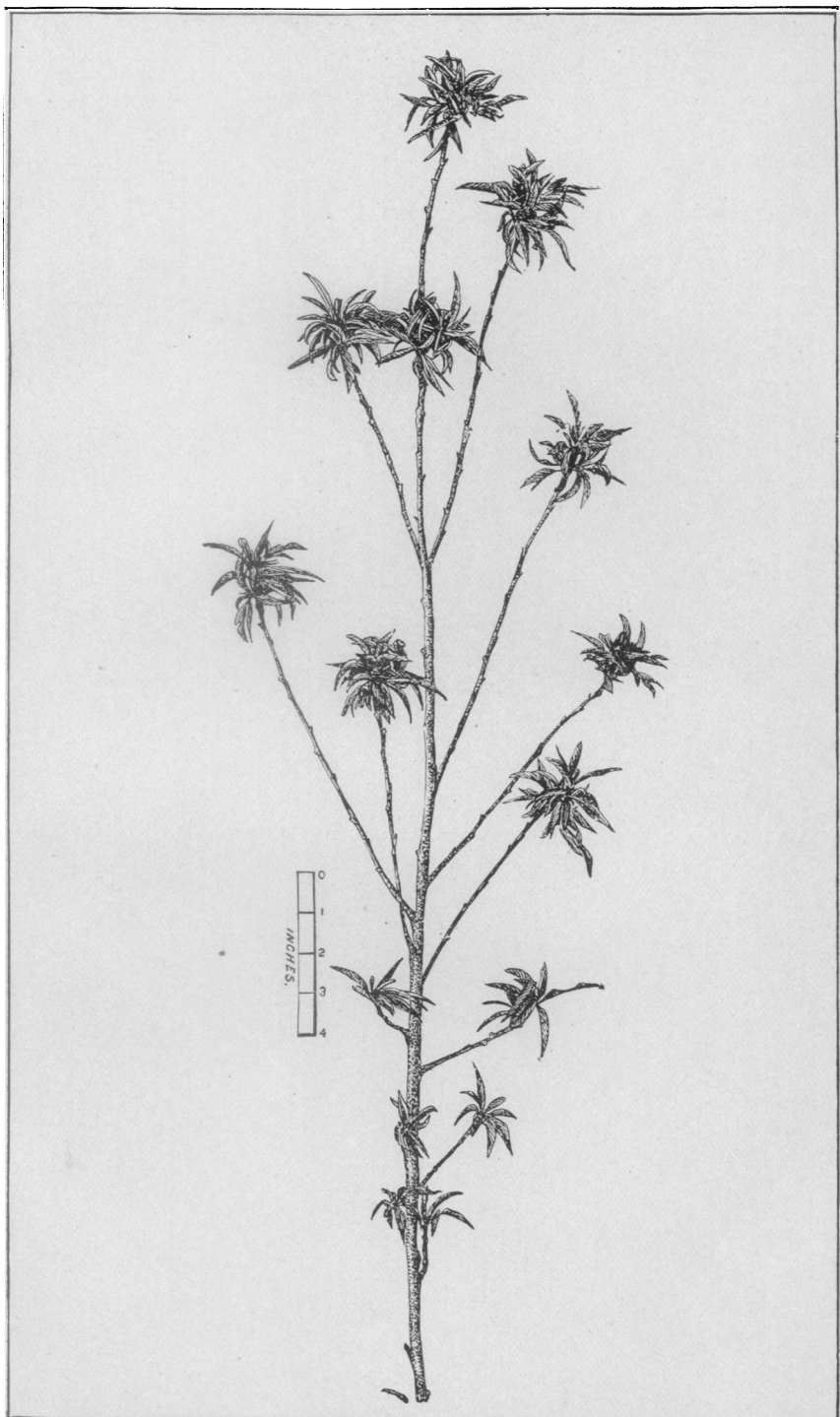
THE ROSETTE. — GEORGIA.



THE ROSETTE. — KANSAS.



THE ROSETTE.—KANSAS.



THE ROSETTE.—KANSAS.

early stages of the disease, which is by no means the case. As a rule, beetles of this group prefer sickly trees. Late in the season many such trees were riddled by *Scolytus*, but they did not appear in numbers until June. The time to make such an examination is in the spring when the disease first appears and not in summer or autumn when the trees are nearly dead. In spring, when the cause of this rosette disease is very active, the *Scolytus rugulosus* can do no harm, because it is then undergoing transformations in the trees which were attacked the previous year. Larvæ and pupæ were taken from a number of such trees. They were generally in winding passages in the wood, and were most abundant in some plum trees not suffering from this disease.

Moreover, repeated observations in Kansas during a two-weeks' visit failed to discover a trace of this insect. Neither had the Experiment Station entomologists ever seen it. The probabilities, therefore, are that this species has not yet appeared at Manhattan.

The *Scolytus rugulosus* does not cause this disease, nor do I think it due to any other insect. Whatever be its cause, the disease is evidently increasing, and peach-growers should be on the alert to destroy it as soon as it appears. The affected trees should be dug out and burned as soon as discovered. The contagious nature of the disease is now beyond dispute, and it is not wise to let them remain a single day.

#### EXPLANATION OF PLATES.

PLATE VIII. Healthy peach tree from an orchard of budded fruit near Griffin, Georgia. Set  $2\frac{1}{2}$  years. This tree stood upon cultivated, level, fertile "mulatto land." Photo, June 28, 1890.

PLATE IX. Tree attacked by the rosette—a typical case. This tree stood in the same orchard as VIII and not over 20 feet distant. It was healthy in 1889. Photo, June 28, 1890, at which time it did not bear a single leaf or shoot-axis of normal character. The bark on the trunk of this tree had been injured by a borer (*Ageria exitiosa*, Say) but over an area not larger than a silver dollar. There were no other injuries by borers; no bruises, and no borings by *Scolytus* anywhere on the trunk or main limbs. To determine the amount of twig injury attributable to *Scolytus*, I examined each one of the several thousand tufted and growing shoot-axes, and all of the internodes, finding three beetles and fifty slight injuries. All these were of recent date, and many did not reach into the cambium. There were no larvæ and no winding passages under the bark. Usually the gnawings were at the base of the tuft on the upper side in the acute angle formed by the shoot and the older stem. These injuries were generally vertical and seldom over one-eighth of an inch long or broad. In no case was a twig of the previous year's growth girdled or so injured as to affect shoots above the boring. The worst injuries amounted simply to the killing of the particular shoot-axis bored into. These had dried up and were easily distinguishable from the uninjured majority. The fact that the dead shoots were nearly as large as the rest showed clearly that the injuries were of recent date, whereas the tree had been diseased throughout for several months, *i. e.*, ever since it began to grow in the spring. The fifty injuries by the beetles were not more serious than would have been a like number of stabs with an awl. Later in the season no doubt the tree might have been full of beetles and larvæ.

- PLATE X. Rosettes from a seedling tree near Sunny Side, Georgia. This tree showed symptoms of disease on only about one-half of its branches. On some of the branches the winter buds had germinated, especially toward the upper ends of the shoots. Photo, July 2, 1890.
- PLATE XI. Diseased peach tree from the budded orchard of T. C. Wells, Manhattan, Kansas. Much smaller than the average. Healthy in 1889, but now affected in all parts. There were no injuries by borers, root aphides, root knot, or *Scolytus*. The winter buds were germinating on some of the tufts. Photo, August 16, 1890.
- PLATE XII. Diseased branch from a seedling tree in the orchard of W. J. Griffing, Manhattan, Kansas. Whole tree affected in the same way. An extreme case of tufting. Photo, August 23, 1890.
- PLATE XIII. Diseased branch from a seedling tree in the orchard of W. J. Griffing, Manhattan, Kansas. The whole tree was affected. Photo, August 18, 1890.

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### TUBERCULOSIS OF THE OLIVE.

PLATES XIV, XV.

By NEWTON B. PIERCE.

During the summer of 1890, I enjoyed the opportunity of meeting, under the most pleasant circumstances, Dr. Luigi Savastano, professor of arboriculture of the Royal High School of Agriculture, at Portici; the latter a beautiful town situated at the base of Vesuvius, on the shores of the Bay of Naples. Dr. Savastano has recently done some excellent work on the tubercle disease of the olive, having conducted several series of experiments with cultures and inoculations which have resulted in clearly demonstrating the bacterial nature of this most interesting malady. These experiments have been carefully repeated by Dr. Fridiano Cavara, of the well-known agricultural school of Pavia, south of Milan. The result has been equally conclusive and interesting. It was my good fortune and pleasure to meet both Drs. Briosi and Cavara of this school, and to have the opportunity of seeing much of their valuable work. The writer was shown an olive tree into which bacilli of the olive tuberculosis had been introduced, and which was showing at the points of infection well-developed tubercles. At its side stood another olive of like size and similarly conditioned, which had been treated in all ways as its companion with the exception that the wounds made by the knife had never received the germs. No signs of a tubercle were to be seen upon this tree. The organisms used in these experiments were from artificial cultures.

During the author's labors in the Mediterranean region, tuberculosis of the olive was encountered at several places and under various conditions. On this account the liberty is taken to append a note or two to a translation of the published account of the concluding experiments of Dr. Savastano.\* There is also given a reproduction of figures pub-

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\* *Il Bacillo della Tubercolosi dell' Olivo, Nota Suppletiva del dott. L. Savastano.* Roma, 1889.